

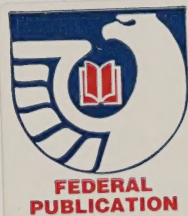
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# Spotted Knapweed

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The invasion of exotic weeds is one of the greatest threats to natural ecosystems in the western United States and Canada (Sheley et al. 1998). On agricultural lands, weeds are defined by their effect on crop production. In natural systems, these invasive plants are further defined by their effects on ecosystem composition and function. Problems commonly associated with invasive weeds include the economic costs of control, reduced quality of agricultural products, and reduced aesthetic and property values. Many natural systems throughout Alaska could be threatened through the decline and disappearance of native plant species associated with these invasions.

Spotted knapweed, *Centaurea biebersteinii* (alt. *C. maculosa*, alt. *C. stoebe* ssp. *micranthos* (Asteraceae)), is one of the most pervasive weeds in western North America. *Centaurea* is a large genus of over 400 species, most originating from the grasslands of central Europe east to central Russia and western Siberia. Several species within the *Centaurea* genus, including spotted knapweed, have become serious problems in North America. Three of these species have potential for serious ecological impacts if they become established in Alaska: diffuse knapweed (*C. diffusa*), Russian knapweed (*Acroptilon repens* formally known as *C. repens*), and yellow star-thistle (*C. solstitialis*). Spotted knapweed was accidentally introduced to North America near the beginning of the twentieth century as a contaminant of alfalfa. In North America, knapweed replaces native grasses and forbs often forming large-scale infestations, which have significant economic and aesthetic impacts to both agriculture and wildlands.



Spotted knapweed was first found in Alaska in Skagway in 1994. National Park Service employees immediately began a hand-pulling operation and due to their diligent control efforts, knapweed has not been found there since 1997 (Claudia Rector pers. comm.). A patch found in Valdez by the University of Alaska Herbarium staff in 2002 was pulled (Carolyn Parker pers. comm.) and approximately 100 new plants were again pulled at that location in 2003 (Jeff Conn pers. comm.). Also in 2003, a new location of three plants were found and pulled by Forest Service employees south of Anchorage along Turnagain Arm and another single plant was found and pulled on Prince of Wales Island (Cole Mayn pers. comm.).

It is unknown how these populations arrived in Alaska, although it is speculated that seeds were brought in as “hitch-hikers” on out-of-state vehicles. The presence of these scattered roadside infestations highlight the need



**Figure 1.** *Spotted knapweed rosette.*

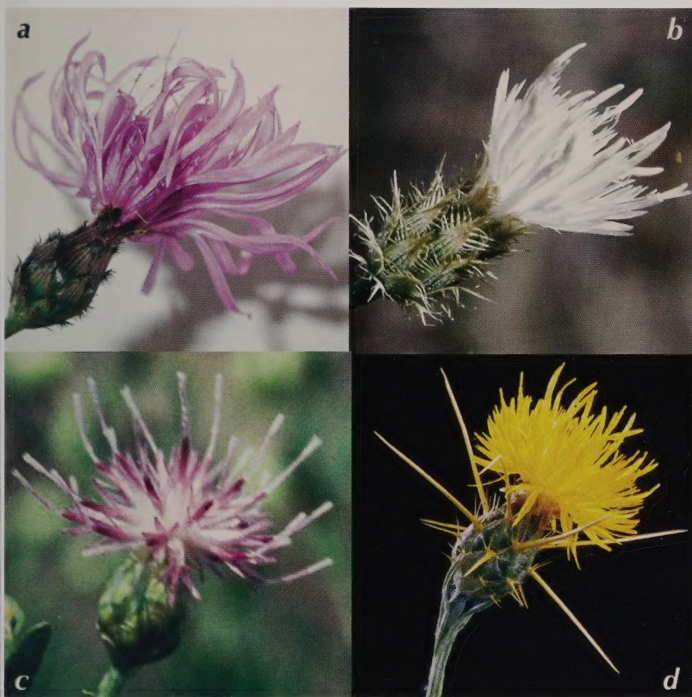


**Figure 2.** *Spotted knapweed flowers and stems.*

to be vigilant so that these small populations can be discovered early and eradicated before they become well established.

## **Description**

Spotted knapweed is a deeply tap-rooted perennial of the aster family. In the first year of growth, each plant produces a rosette of basal leaves (Figure 1). These deeply lobed leaves radiate from a common point and measure up to 6 inches long with leaf margins indented about halfway to the midrib. In the following



**Figure 3.** Comparison of flowers from a) spotted knapweed, b) diffuse knapweed, c) Russian knapweed and d) yellow star-thistle.

and subsequent years, each plant produces, one to ten multiply branched stems. Individual stems are generally 1 to 3 feet long, with stem height varying from 1 to 2 feet on dry upland sites to over 4 feet on sites receiving additional moisture. Each stem culminates in a single pinkish purple flower, similar to that of the cultivated bachelor's buttons, at the tip of each branch (Figure 2). Each flower has dark colored hairs at the tips of the bracts beneath the flower petals creating a spotted appearance that gives the plant its name. Finely divided stem leaves of mature plants arise from several points along the stem, with stems and foliage a distinctive gray-green color.



Diffuse and Russian knapweed share many common characteristics with spotted knapweed including upright growth form, rosette formation, bachelor's button-like flower, and distinctive coloration of stems and foliage. However, diffuse knapweed has white flowers with yellow-spined bracts with teeth appearing as combs along the spine margins, and Russian knapweed has cone-shaped flowers with rounded bracts (Figure 3). Yellow star-thistle has long yellow spines (up to 1 inch) extending out from the bracts below the bright yellow flowers making it highly irritable to both hikers and grazing wildlife (Figure 4).



**Figure 4.** *Yellow star-thistle flower with spines.*



## Life History

Spotted knapweed reproduces solely by seed, with plants typically producing up to 1,000 seeds per year. These seeds are extremely long-lived and are able to remain viable in soil for eight or more years. The seeds are capable of germinating in both early spring and fall, and seedlings become established wherever adequate space and moisture are available. Knapweed overwinters as a rosette and resumes growth in early spring. Knapweed produces new flower stalks each year and older stalks remain creating a gray cast to the landscape. Flowers bloom from July through August; individual flowers bloom for 2 to 6 days before the bracts close. Bracts reopen after approximately 20 days allowing seeds to be easily dispersed by physical movement of the plant (Duncan et al. 2001).

Although only spotted knapweed has been found in Alaska at this time, it is not the only member of the genus that may be able to thrive here. All of the other species mentioned above have been found throughout North America. Flowering is primarily from June through September resulting in profuse seed production. These plants are often associated with disturbed sites such as roadsides, fallow fields, and waste areas.

## Impacts

Spotted knapweed is a concern for several reasons. Most notably, it is capable of growing in a wide range of conditions from highly disturbed roadsides to intact forest openings, often replacing the native vegetation and creating large monotypic stands (Figure 5). Spotted knapweed

infestations lower the number and diversity of native plants with the potential for large-scale and long-term ecosystem-level effects including reduced wildlife habitat and increased surface water runoff and subsequent erosion (Duncan et al. 2001).

Spotted knapweed is well adapted to a wide range of habitats including, but not limited to, open forests, urban interfaces, and rangelands. Although not well suited to riparian areas, it has been noted to invade streambanks and nearby meadows, wherever disturbance occurs or people visit. Though most common in disturbed sites, disturbance is not necessary for knapweed to establish and thrive.

In Alaska, likely plant communities at risk are open riparian forests, bluffs along river systems, open spruce-birch forests, or sites with frequent natural disturbances. Sites such as steep slopes or recently burned areas with exposed mineral soil would be especially at risk.

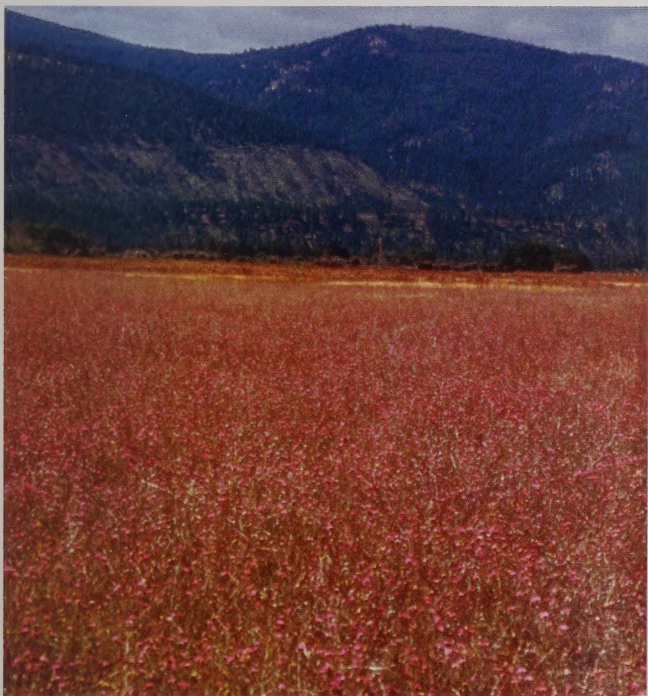
## **Guidelines for Control Options**

Management of spotted knapweed, as with other exotic weeds, will maintain healthy native plant communities and meet desired land-use objectives such as improving livestock forage, wildlife habitat, or quality recreational opportunities. Once spotted knapweed becomes established, it has proven quite difficult to manage. For that reason, by far the most desirable and cost effective control option for Alaska is early detection and rapid control of introductions to prevent populations from becoming established.

If populations are found early (i.e. patch size less than 1/10th acre) hand-pulling is a viable option for control. It is important to note that

pulling knapweed plants can be difficult and must be timed so that seeds are not spread in the process. Pulled plants should be incinerated or bagged and taken to a waste collection facility. Gloves are recommended, as some people have been known to develop a reaction to the plant stems.

Chemical herbicides are recommended for the eradication of new infestations too large or difficult to pull. Although herbicides can be highly effective, most are relatively broad spectrum in their effects, often removing many desirable native plants along with the target weeds. If knapweed has a spotty distribution, small spot treatments are a good strategy to limit the loss of native vegetation. Spraying is best done in early spring, while the plant is still in the rosette stage. Due to



**Figure 5.** *A spotted knapweed infestation near Missoula, Montana.*



long-lived seed, herbicides must be reapplied periodically. Herbicide treatments on large-scale infestations are most effective when combined with other control methods that enhance the competitive ability of desired plant species.

Mowing is often inefficient because the plants will adapt a horizontal growth form and flowers will remain below the level of the cutting blades. Grazing by sheep and goats has had limited success in states such as Montana and Idaho. However, any control method that disturbs the soil surface may increase the potential for knapweed to thrive.

If spotted knapweed, or any of the related species mentioned are found, please notify your local extension office immediately.

**Caution:** Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife—if they are not handled or applied properly. Use all pesticides selectively and carefully. Since approved uses of a pesticide may change frequently, it is important to check the label for current approved and legal use.

Follow recommended practices for the disposal of surplus pesticides and pesticide containers. Mention of a pesticide in this publication does not constitute a recommendation for use by the USDA, nor does it imply registration of a product under Federal Insecticide, Fungicide, and Rodenticide Act, as amended. Mention of a proprietary product does not constitute an endorsement by the USDA.

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**Figure 2:** J. Story, from the Bugwood Network, [www.bugwood.org](http://www.bugwood.org), The University of Georgia Cooperative Extension Service, Tifton, GA.

**Figure 3:** **a:** M. Shephard, Ecologist, USDA Forest Service, Alaska Region, State and Private Forestry, **b:** C. Roche, from the Bugwood Network, [www.bugwood.org](http://www.bugwood.org), The University of Georgia Cooperative Extension Service, Tifton, GA, **c:** E. Coombs, from the Bugwood Network, [www.bugwood.org](http://www.bugwood.org), The University of Georgia Cooperative Extension Service, Tifton, GA, **d:** C. Turner, from the Bugwood Network, [www.bugwood.org](http://www.bugwood.org), The University of Georgia Cooperative Extension Service, Tifton, GA.

**Figure 4:** N. E. Rees, from the Bugwood Network, [www.bugwood.org](http://www.bugwood.org), The University of Georgia Cooperative Extension Service, Tifton, GA.



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## Spotted Knapweed

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Additional information on this plant can be obtained from your local UAF Cooperative Extension office, Alaska State Forestry office, or from:

### **Forest Health Protection, State & Private Forestry USDA Forest Service**

3301 "C" Street, Suite 202  
Anchorage, Alaska 99503  
Phone: (907) 743-9455

2770 Sherwood Lane, Suite 2A  
Juneau, Alaska 99801-8545  
Phone: (907) 586-8883

3700 Airport Way  
Fairbanks, Alaska 99709  
Phone: (907) 451-2701

Or:

[www.fs.fed.s/r10/spf/fhp/fhpr10.htm](http://www.fs.fed.s/r10/spf/fhp/fhpr10.htm)

**Cover photo:** *Spotted knapweed plant found along Turnagain Arm at Rainbow.*

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